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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

France Telecom, S.A.,
Plaintiff,

vs.

Marvell Semiconductor, Inc.,
Defendant.

Case No. 3:12-cv-4967-WHO

PLAINTIFF'S MEMORANDUM IN OPPOSITION TO MARVELL SEMICONDUCTOR, INC.'S MOTION FOR JUDGMENT AS A MATTER OF LAW & RULE 52 MOTION FOR JUDGMENT

Date: January 14, 2015
Time: 3:00 pm
Place: Courtroom 2, 17th Floor, San Francisco Courthouse
Judge: Hon. William H. Orrick

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France Telecom respectfully submits this Memorandum in Opposition to Marvell Semiconductor, Inc.'s Combined Rule 50(B) Motion for Judgment as a Matter of Law & Rule 52 Motion for Judgment (the "Post-Trial Motion"). For the reasons set forth below, the Court should deny Marvell's Post-Trial Motion in its entirety.

LEGAL STANDARD

"In bringing their Rule 50 motion for judgment notwithstanding the verdict, defendants must vault a very high hurdle." *Settlegoode v. Portland Pub. Sch.*, 371 F.3d 503, 512 (9th Cir. 2004); *Metoyer v. Chassman*, 504 F.3d 919, 940 (9th Cir. 2007). To prevail, Marvell must show that no reasonable jury could have found in France Telecom's favor based on the evidence presented at trial. *Id.*; *Lakeside-Scott v. Multnomah County*, 556 F.3d 797, 802 (9th Cir. 2009). To grant a Rule 50 motion, the court must review the evidence and find that there is such an "overwhelming amount of evidence in favor of [the moving party] that reasonable and fair minded men could not arrive at a verdict against [it]. This is a high burden." *Whitserve, LLC v. Computer Packages, Inc.*, 694 F.3d 10, 21 (Fed. Cir. 2012). Marvell has not come remotely close to meeting this burden.

ARGUMENT

I. THE EVIDENCE CLEARLY ESTABLISHED DIRECT INFRINGEMENT

A. The Evidence Established that the Accused Products Infringe Claim 1

Marvell contends that the accused products do not infringe claim 1 because they do not provide "parallel outputs of distinct series of coded data elements" and do not implement "two steps of 'systematic convolutional coding.'" (Post-Trial Motion at 2.) Marvell's arguments lack merit. The evidence clearly established that the accused products satisfy each of these claim limitations.

1. The Accused Products Provide "Parallel Outputs of Distinct Series of Coded Data Elements"

(a) Claim 1 Requires Only Two Distinct Sets of Coded Data Elements

The accused products provide "parallel outputs of distinct series of coded data elements" as required by claim 1 of the '747 Patent. France Telecom's expert, Dr. Michael Mitzenmacher, presented substantial evidence on this point at trial. First, Dr. Mitzenmacher explained that the error-correction method described in claim 1 requires output of a ***total of at least two*** sets of coded data elements output in parallel, a "Y1" output and a "Y2" output, as illustrated in Figure 1:

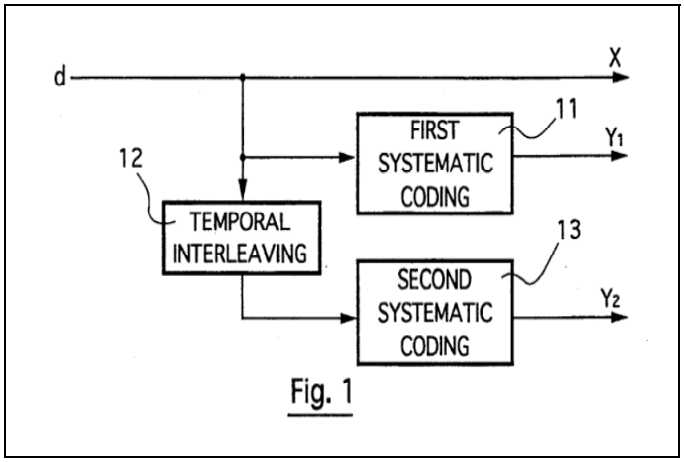

Fig. 1 of the '747 Patent

> So we've seen that each step is taken into account all of the said source data elements and providing parallel outputs, a distinct series of coded data elements. In the figure that's shown as the Y1 and Y2. ***The Y1 and Y2 are the coded data elements. And we can see that they are again in parallel outputs***.

(Tr. 501:25-502:5) (Mitzenmacher) (emphasis added).

Dr. Mitzenmacher further testified that the accused products provide "parallel outputs of distinct series of coded data elements" precisely as required by claim 1 in the form of Y and Y'.

> Q. Could you explain your conclusion on infringement. . . .
>
> A. Yes. The data comes in. Again, a copy is sent to each of the RSC encoders. And we see the parallel outputs of distinct series of coded data elements. Y and Y prime.

(Tr. 511:6-22) (Mitzenmacher); (Tr. 506:19-22) (Mitzenmacher) (""Providing parallel outputs of distinct series of coded data elements." That corresponds -- the coded data elements are the Y and the Y prime."). This is also shown in Marvell's documentation. (Ex. 112 at 19536, Fig. 41.) The jury was free to accept the testimony of Dr. Mitzenmacher and to reject that of Dr. Min. Thus, substantial evidence was presented at trial to support the jury's verdict that the accused products provide "parallel outputs of distinct series of coded data elements" precisely as required by claim 1.

(b) Each Coding Step of the Accused Marvell Devices Itself Outputs Parallel Sets of Coded Data Elements

Nevertheless, Marvell contends that it is not sufficient for infringement that its accused products output two series of coded data elements in parallel. Rather, Marvell argues that claim 1

requires that ***each coding step*** itself separately output two parallel series of coded data elements, for a total of four coded outputs. (Post-Trial Motion at 3-4.) Marvell's argument is wrong for several reasons. First, Dr. Mitzenmacher testified that one skilled in the art would understand claim 1 to require only ***two total*** outputs of coded data elements in parallel (Y1 and Y2), one from each coding step. (Tr. 502:1-5) (Mitzenmacher) ("providing parallel outputs, a distinct series of coded data elements. In the figure that's shown as the Y1 and Y2. The Y1 and Y2 are the coded data elements. And we can see that they are again in parallel outputs."). Indeed, Dr. Mitzenmacher further explained that these ***two*** sets of coded outputs are what provided power to the coding method:

> And, again, the way Professor Berrou developed this redundancy is he said, I'm going to get this redundancy. Let's call it, say, Y and Y prime. It's actually going to come from two different parts. We're going to use two codes. One code will give us one part of the redundancy. One code will give us the other part of the redundancy.
>
> You can see that here (indicating), if you use Y1 and Y2. . . . But you have the two codes here that are providing different pieces of the redundancy.

(Tr. 496:4-12) (Mitzenmacher).

Furthermore, even if Marvell were correct that each coding step itself must output two parallel sets of coded data elements (for a total of four), there is substantial evidence in the record that shows that Marvell's accused products do precisely that. Specifically, Dr. Mitzenmacher testified that the Marvell source code shows that ***each RSC Encoder*** in the Marvell device itself outputs two series of coded data elements, a "Y0" and a "Y1", even though this extra coded output (per encoder) was not necessary to Dr. Mitzenmacher's analysis:

> At line 648 and to 650 for the first coder, and line 663 to 665 for the second encoder, those are the outputs. They're labeled RSC 0X, ***RSC 0Y0, RSC 0Y1 for the first encoder***, and just to differentiate the outputs 01, RSC 1X, ***RSC 1Y[0] and RSC 1Y1 for the second encoder***.
>
> Now, you may notice there are three outputs for each of them. We're only interested in the two, the ones labeled X out or Y0 out for the first encoder and the second encoder. It turns out these output something else, a third output. That does not impact my analysis, and that's because of the word "comprises" in the claim language. Remember you have to have at least these outputs, at least these two coded outputs. You could also have extra.

(Tr. 517:8-22) (Mitzenmacher) (emphasis added); (Tr. 520:1-2) (Mitzenmacher) ("what are the

outputs from the RSC encoder? They're X out, Y0 out and Y1 out. These are the outputs").

Dr. Min provided no testimony purporting to challenge Dr. Mitzenmacher's conclusion. In any event, the jury was free to accept Dr. Mitzenmacher's testimony on this issue in its entirety and to reject the evidence, if any, that Marvell presented on this point. Thus, substantial evidence was presented at trial to show that the accused products provide "parallel outputs of distinct series of coded data elements" even under Marvell's erroneous interpretation of claim 1.

2. The Accused Products Implement Two Steps of "Systematic Convolutional Coding"

(a) Substantial Evidence Establishes That the Accused Products Implement Two Steps of "Systematic Convolutional Coding"

Substantial evidence also was presented at trial showing that the accused products implement two steps of "systematic convolutional coding" as required by claim 1 of the '747 Patent. The Court construed the term "systematic convolutional coding" to mean "[c]onvolutional coding where the output includes both the coded data and the current input data". (D.I. 141, at 19.) France Telecom's expert, Dr. Mitzenmacher, testified at trial that Marvell's accused products meet the limitations of claim 1 precisely as the Court has construed that claim:

> [T]he steps correspond to in the Marvell turbo encoders are these two dashed boxes you see in the figure. And you'll see that they're labeled "RSC Encoder 1" and "RSC Encoder 2." Encoder 1 is the first step. Encoder 2 is the second step.
>
> They are, indeed, steps of systematic convolutional coding. Indeed, RSC, as we've heard from Professor Berrou -- and it's a very common acronym in the coding literature -- stands for "recursive systematic convolutional." So their document says that it's a systematic convolutional code.

(Tr. 505:15-25) (Mitzenmacher). Dr. Mitzenmacher further explained:

> Q. Now, in these steps is the current input data also output?
>
> A. Yes. So the current input data is also output as well. Again, looking at the []top coder the data comes in. And this is another branching point where a copy is passed out directly. And here it's labeled X. In the second encoder, again, they're identical. That same things happens. Here they label it X prime.

(Tr. 507:18-508:2) (Mitzenmacher).

Marvell's documents confirm that the accused products implement two steps of "systematic convolutional coding" as construed by the Court. The documents show that each coding step (RSC

Encoder) outputs both a coded data element (Y and Y') and the current input data (X and X').

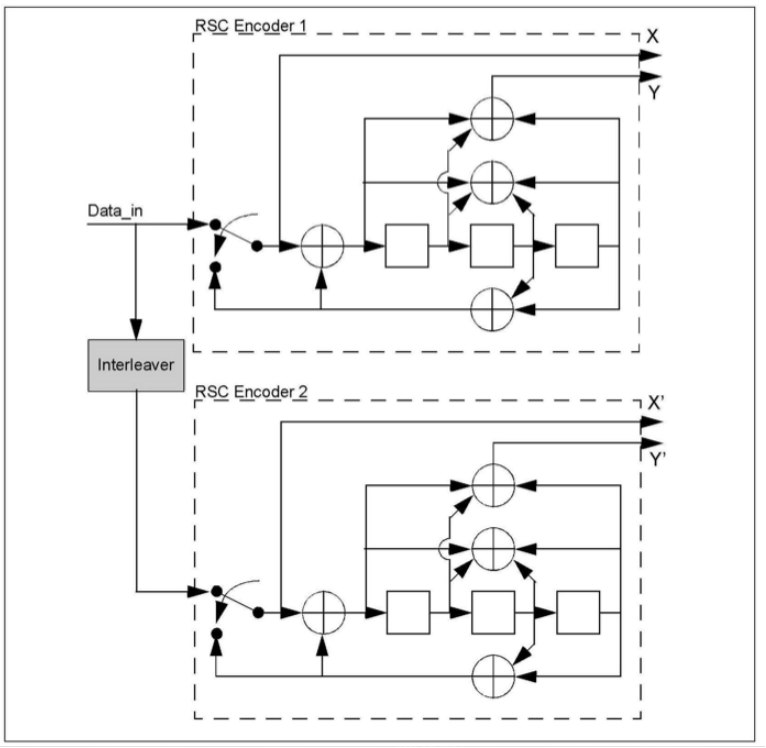

Fig. 41: Marvell PXA 940 External Architecture Specification

The jury was free to credit Dr. Mitzenmacher's testimony as well as Marvell's own technical documents in rendering its infringement verdict. Accordingly, substantial evidence was presented at trial to support the jury's verdict that the accused products implement at least two steps of "systematic convolutional coding" as required by claim 1 of the '747 Patent.

(b) The Jury Properly Rejected Marvell's Misleading Presentation

Faced with clear and convincing evidence establishing infringement, Marvell resorted to trying to confuse the jury by manipulating its own technical documentation to "gray" out and deemphasize the X' output from RSC Encoder 2:

> Q. Okay. But for some reason, although you kept in everything from this first encoder, you kept in everything from this first encoder (indicating). You just erased in your depiction of the second encoder, encoding step, you just erased the "X." You just erased it. It just disappeared? . . .

A. I marked it on gray.

Q. Marked it in gray. So you deemphasized it; is that fair to say?

A. I mark it in gray, as it's not a signal that's coming out the turbo encoder.

(Tr. 97:23-398:14) (Dagan).

Q. Okay. Now, in this -- on the right-hand side has a depiction of Figure 41?

A. Yes.

Q. Okay. Which is from the Marvell product brochure that you talked about?

A. ***Well, just to be clear, it's a Figure 41 that Mr. Dagan has modified. He's grayed out one of the lines***.

Q. Right. I'm going to ask you about that, actually.

A. Okay.

Q. I'll put up Figure 41 here, just so we have it in mind. This is from MSIFT page 19536. This is the figure you talked about during your direct testimony, right?

A. Yes.

Q. Okay. So you understand that the Y and the Y prime are coded data, right?

A. Yes.

Q. And the X, the X that's at the top here is current input data that is output, right?

A. Yes, both the X and the X prime, in fact.

(Tr. 560:23-561:16) (Mitzenmacher) (emphasis added).

The jury was free to disregard Marvell's crude attempt to manipulate the evidence, especially given that Marvell's witness, Mr. Dagan: (i) testified that RSC Encoder 1 and RSC Encoder 2 were identical; (ii) claimed not to know that "RSC" stood for Recursive ***Systematic*** Convolutional encoder; (iii) failed to previously "gray" out or deemphasize any features in his deposition; and (iv) otherwise confirmed the accuracy of Marvell's unadulterated technical documents.

Q. Okay. And then it says the turbo encoder is composed of two identical encoders; do you see that?

A. Yes.

Q. Is that a correct statement?

A. Yes, two RSC encoders, yes.

(Tr. 387:24-388:3) (Dagan).

Q. The second RSC encoder. And let me ask you a question about that. RSC encoder, what do those -- actually, those initials stand for recursive systematic convolutional coder, correct?

A. I don't know. . . .

Q. You're not familiar with -- you're testifying to the operation of a turbo encoder, and you don't know the names of the components in the turbo encoder?

A. I don't know what is RSC. . . .

(Tr. 389:10-25) (Dagan).

Q. And I asked you does this page, this page itself: "Does this page describe the PXA 930 turbo encoder architecture? And you said "Yes, it does." Do you recall that?

A. Yes.

Q. And I asked you: "On those devices that we discussed so far, do they use the same turbo encoder architecture as depicted on this, on this page?"

A. Only the ones with WCDMA.

Q. Correct. And you didn't at that point shade or highlight what was depicted, you just said "yes"?

A. I did.

(Tr. 408:17-409:5) (Dagan). *See also* (TR. 394:18-20) (Dagan) (". . . the RSC encoder 1 and RSC encoder 2, they're identical? They're identical, correct? A. How the coder describes them is the same"); (Tr. 386:3-11) (Dagan) (Figure 41 of the system architecture document is accurate).

The jury was free to reject Marvell's attempt to manipulate the evidence for the further reason that Marvell's own witness, Mr. Dagan, admitted that the current input data is "generated" or output from the parallel RSC Encoder steps:

Q. So you would say that these two, these two encoding steps here are parallel (indicating)?

A. They are running in parallel during the encoding phase of the turbo encoder.

* * *

Q. Okay. Now, you see that where that juncture we discussed earlier is, is before it gets into the convolutional coder, correct, there's a juncture here where the data you said gets sent in two directions. That's before it gets into the convolutional encoder, correct?

A. Before it pass through the state machine, yes.

Q. So the other copy of the same data that's coming in goes out without any coding, correct?

A. As I said, it's the same value.

Q. Same. So it's an uncoded value. It's the current input data?

A. It's the same value.

Q. It's fair to say that's the same input data, correct?

A. Yes.

* * *

Q. Fair enough. So from the RSC encoder, there are two things generated, X and Y, correct?

A. Both X and Y are generated by RSC.

(Tr. 391:5-8; 393:3-16; 394:14-16) (Dagan). The jury rejected Marvell's attempt to manipulate the evidence and properly found that Marvell's chips implemented two steps of "systematic convolutional coding" as required by claim 1.

(c) The Court Should Reject Marvell's New Claim Construction

Now that the jury has rejected Marvell's non-infringement position, Marvell has reversed course in its Post-Trial Motion and disavows the very claim construction of "systematic convolution coding" that it proffered, and that the Court adopted, in this case. Specifically, Marvell contends that it is not sufficient for infringement that each coding step output "both the coded data and the current input data." Rather, according to Marvell, to establish infringement, each coding step must output both the coded data and the current input data ***and*** all of the outputs must be transmitted by the encoder as a whole. (Post-Trial Motion at 5-8.) This Marvell argument is baseless. Indeed, Marvell's new "interpretation" of the claim language is contrary to the definition of "systematic convolutional coding" that Marvell's own counsel, Mr. Johnson, used at trial:

Q. And with respect to the term systematic convolutional coding, ***this means the***

> ***output from each coding step includes both the coded data and the current input data***?
>
> A. Yes, that's the definition the Court gave, and that I used.

(Tr. 560:8-12) (Johnson cross-examination of Mitzenmacher) (emphasis added). As demonstrated above, the evidence overwhelmingly shows that the output of each RSC Encoder in the Marvell accused products itself ***outputs*** both the coded data (Y and Y') and the current input data (X and X'). That is all that is required under the Court's claim construction.

Marvell's new "interpretation" of the claim language also is contrary to the arguments that Marvell made during claim construction to obtain its proffered construction of "systematic convolutional coding." At that time, Marvell argued that "transmitting" data had nothing to do with claim 1, let alone the meaning of the term "systematic convolutional coding" in that claim:

> Under [France Telecom's] construction, any convolutional coding step is "systematic" as long as source data elements are "transmitted jointly" with coded data elements. "***Transmitting" is not even required by the claim and is not a step, let alone part of the coding step***. In essence, France Telecom argues that "systematic" is not a characteristic of the coding step, but rather a characteristic of the claimed method, ***even though the claim does not require transmitting*** and the language requires ***each coding step*** to be "systematic."

(D.I. 91 at 12) (emphasis added); *see also id*. at 19 ("[F]or each of the coding steps to be systematic, each coding step must include its respective input data as part of ***its respective output***") emphasis added); *id*. at 11 ("The passage does not talk about coding systematically, but rather transmitting systematically. (*Id.*) France Telecom relies on this passage ***but it does not define or describe the claimed step, it only describes the unclaimed step of 'transmitting***.'") (emphasis added). The Court should reject Marvell's meritless flip-flopping, resulting solely from its lack of success at trial.

Marvell further contends that the jury verdict should be set aside because it is "undisputed" that the coding rate of Marvell's accused products is 1/3, while claim 1 purportedly "requires" a coding rate of 1/4. (Post-Trial Motion at 5-6.) This argument, too, is groundless for several reasons. First, claim 1 does not require a specific coding rate. The Court has already expressly held as much in its claim construction order: "Further, neither the patent nor, more specifically, its claims require the coding rate to be 1/3. In fact, the claims are silent about rates altogether—if the inventor wanted

to claim a certain coding rate, he could have done so, but he did not." (D.I. 141 at 14.)

Second, the "coding rate" of the Marvell accused products is not "undisputed," as Marvell contends. Dr. Mitzenmacher testified at trial that ***the coding steps*** of the Marvell accused products have a coding rate of 1/4, even though the turbo encoder as a whole may have a coding rate of 1/3. Dr. Mitzenmacher explained that this was due to the operation of a selector located after the coding steps, which has the capability to select the outputs that go into the output shift register.

> A. So it mentions here the code rate. The turbo encoder operates at code rate 1/3. So it outputs the data bit X, and keyed code bits Y and Y prime. We may hear a bit about further, this is not discussing the two coding ste[p]s. This is discussing the turbo encoder as a whole. So this part is not particularly relevant to my analysis of infringement because it goes beyond, it's extra beyond the two coding steps that are the subject of the claim.
>
> Q. And how many outputs, total, are there in relation to the one input into the coding steps?
>
> A. When we look at the coding steps for each input, we're going to get four outputs. Okay. We'll have the X, the Y, the X prime, and Y prime. So for each thing, each bit of data that goes into the encoder, we'll have two outputs from the first. Identically, we'll have two outputs from the second. A total of four from the two coding steps.
>
> * * *
>
> So first, what we've seen is that each of these encoders produces two outputs, and Mr. Dagan talked about this output shift register, but the output shift register, remember, is after. That's well after the two encoding steps, and in fact, there's something between here, there's something that I was just showing you in the code that I am going [to call] the selector. It's going to potentially select from the possible outputs what the turbo encoder itself will actually output, and it's actually after that selector step that things get put into the output shift register, so again, the key is that in terms of my infringement analysis, I'm looking at the outputs of the coding steps, which do indeed include these four outputs as we've seen.
>
> * * *
>
> So again, he grayed out this line, but to be clear, as we've seen in the code, this X prime is output from the RSC encoder. And then these four things are put into the step that I called the selector that occurs after these two encoding steps, and once things are in the selector, then various selections might occur and fewer of these might actually be sent to what he was calling the output shift register, but again for purposes of infringement, all of this is happening after the two encoding steps that are the subject of the claim.

(Tr. 510:5-21; 522:25-523:12; 524:16-24) (Mitzenmacher).

Dr. Mitzenmacher further illustrated this point for the jury in a demonstrative exhibit, which showed the placement of the selector and shift register within the Marvell turbo coder after the two encoding steps. The jury was free to credit Dr. Mitzenmacher's testimony and reject the contrary argument advanced by Marvell, particularly given that Marvell's own witness admitted that the outputs from the RSC encoder are deselected later, at the shift register, and that Marvell's coding rate argument related to the turbo encoder as a whole rather than the coding steps.

> Q. Well, where is the switch depicted here that cuts off? Can you point to the switch here which cuts off that data and stops it from being transmitted along this very clear black line in your architecture specification, but de-emphasized in this gray line in your demonstrative?
>
> A. I didn't say there is a switch that disconnected. I said that the output shift register doesn't contain this, and this is not in the turbo encoder output.
>
> Q. So the output shift register, to be clear, the output shift register doesn't contain whatever is put out of there; that's what you're saying?
>
> A. It doesn't use it.

(Tr. 399:12-23) (Dagan); *see also* (Tr. 382:15-19) (Dagan) ("Q. In what way are bits output from the turbo encoder in Marvell's WCDMA chips? A. Inside the code we have the output shift register, which I mentioned earlier, and it takes signals from the RSC encoders, and it creates the output of the turbo encoder.")

The Court should reject Marvell's attempt to secure a new claim construction and affirm the jury's well-supported finding that the accused Marvell products infringe claim 1 of the '747 Patent.

B. The Evidence Presented at Trial Establishes Direct Infringement

1. Substantial Evidence Supports the Verdict of Infringement Against MSI

Substantial evidence likewise supports the jury's verdict of direct infringement against MSI in this case. For example, there was direct evidence of massive testing of the accused Marvell products within the United States. Marvell's witness, Mr. Rothmann, testified as follows:

> Q. Okay. Now you said earlier that you tested the Tavor chip in the United States. That was on the AT&T network, correct?
>
> A. Yes, for them.

Q. That was in the 2008 time frame, you said?

A. It was -- the beginning was pretesting on 2008. And then the real testing, the ***massive testing*** was done on 2009 and 2010.

* * *

Q. And you tested in Seattle, Washington, did you not?

A. We did testing also in Seattle, Washington.

Q. And you tested in Chicago, Illinois, did you not?

A. Yes.

Q. You tested in Austin, Texas, did you not?

A. Yes.

Q. And you tested in Miami, Florida, did you not?

A. Yes.

Q. And you tested in Boston, did you not?

A. Yes.

(Tr. 431:14-21; 432:2-11) (Rothmann) (emphasis added); *see also* (Tr. 434:5-8) (Rothmann) ("And for this we have done testing over ten different cities in the U.S. in order to verify that their phone would work well on the AT&T network as part of AT&T requirement.").

Mr. Rothmann further testified that the turbo encoder that was "massively" tested in the United States was the same turbo encoder that is used in all of the accused Marvell products:

Q. To be clear, you tested the device in the field with a turbo encoder in it; is that correct?

A. Yes.

Q. Okay. And all -- is it your understanding that in all the devices that have a 3G turbo encoder, every device has the same or essentially the same turbo encoder?

A. I assume, yes.

(Tr. 437:8-14) (Rothmann); (Tr. 371:18-21) (Dagan) ("Q. Now, how does the turbo encoder circuitry compare between Marvell's various WCDMA various communications processors? A. For all the WCDMA communication processor, the turbo encoder is the same."); (Tr. 598:21-599:1) (Mitzenmacher) ("all the turbo encoders, as we've heard from several different witnesses and from

the documentation, are all the same. So my opinion that -- you know, different numberings don't especially matter in the sense that they're all testing the same turbo encoder . . .").

Dr. Mitzenmacher also testified as to the testing and concluded that this and other evidence established infringing use of the accused Marvell products in the United States:

> Q. Did you review -- in your review of the deposition testimony of Marvell's witnesses, did you include in your review the deposition testimony of Mr. Rothmann?
>
> A. Yes.
>
> Q. And did he discuss testing of Marvell's devices?
>
> A. Yes, he did.
>
> Q. And what did he discuss?
>
> A. In particular he discussed field testing in various U.S. cities, including I believe Seattle, Austin, Chicago, a few others, and in particular he discussed field testing of various types.
>
> Q. And what particular types.
>
> A. In particular he talked about uplink testing, uplink testing and sending data from the cellular processor, such testing would include the turbo encoder.
>
> Q. And I have one last question for you, Dr. Mitzenmacher. Do you have an opinion on whether the Marvell turbo encoder has been used in the United States?
>
> A. Yes.
>
> Q. And what is that opinion?
>
> A. According to the information I've seen, the various marketing and other information, sales and so on, I would say yes, it has been used in the United States.

(Tr. 544:4-545:1) (Mitzenmacher).

Marvell nevertheless contends that the infringing use of its accused products in the United States cannot be attributed to it for purposes of infringement because the testing purportedly was performed by its affiliate, Marvell Israel. (*See* Post-Trial Motion at 8-9.) This argument lacks merit. In these circumstances, Marvell may be held liable for the testing under doctrines such as ratification and agency. *Bangkok Broad. & T.V. Co. v. IPTV Corp.*, 742 F. Supp. 2d 1101, 1120 (C.D. Cal.

2010) (affiliate may be held accountable where it "ratifies the acts of the subsidiary corporation"); *Bowoto v. Chevron Texaco Corp.*, 312 F. Supp. 2d 1229, 1247 (N.D. Cal. 2004) ("[A]n agency may be created, and an authority may be conferred by a . . . subsequent ratification." (citation omitted); *Strikeforce Techs, Inc. v. Phonefactor, Inc.*, Civ. A. No. 13-490, 2013 U.S. Dist. LEXIS 162113, at *15 (D. Del. Nov. 14, 2013) (affiliate may be liable under agency theory when it authorized or directed activity in question). Similarly, an agency may be found where an affiliate functions as an entity's representative in performing services that are sufficiently important that if it did not have a representative to perform them, the entity would undertake to perform similar services on its own. *Bowoto*, 312 F. Supp. 2d. at 1243; *E & J Gallo Winery v. EnCana Energy Servs., Inc.*, No. CV 0305412, 2008 WL 2220396, at *5-6, 11-12 (E.D. Cal. May 27, 2008).

Substantial evidence was presented at trial establishing that Marvell Israel was acting on behalf of Marvell in connection with the infringing testing, and that Marvell ratified and adopted the testing as its own. Marvell's witness admitted that Marvell advertised the testing in question:

> Q. Does Marvell Semiconductor Inc. advertise that its chips are tested?
>
> A. Yes.
>
> * * *
>
> Q. So here Marvell Semiconductor Inc. is advertising extensive platform validation; is that correct?
>
> A. Yes.
>
> Q. And they're advertising extensive UMTS. That's a 3G standard, correct?
>
> A. It's a 3G standard.
>
> Q. And that's a 3G standard that's used in the United States; is that correct?
>
> A. It is used in many places in the world, including some networks in the U.S.
>
> * * *
>
> Q. Then it says Marvell has executed an intensive IOT program for this series of chips, tests that includes testing at infrastructure manufacturers' laboratories, wireless service providers labs, and in the field.
>
> A. Yes.

(Tr. 424:22-24; 427:16-25; 428:23-429:2) (Rothmann); *see also* (Tr. 427:1-13) (Rothmann)

(attributing advertisements to Marvell Semiconductor, Inc.); (Tr. 540:14-541:4) (Mitzenmacher) ("[Exhibit 97] talks about extensive platform validation, that is testing that was done."); (Tr. 542:9-13) (Mitzenmacher) ("[Exhibit 98] is similar to the other document. This is a marketing document describing the PXA 910. . . . It also discussed the importance of validation versus extensive worldwide tests."); (Tr. 543:3-6) (Mitzenmacher) ("[Exhibit 102 show the] same things that we've seen in the others. It's a marketing document, this time describing the 968. It discusses . . . various aspects of field testing."); (Tr. 543:22-24) (Mitzenmacher) ("[Exhibit 103 is] a similar marketing document for the 978 . . . and in particular discusses testing.")

Marvell's witness, Mr. Rothmann, further admitted that the testing (and Marvell's advertisement thereof) was ***crucial*** to Marvell's business in selling chips. In doing so, Mr. Rothmann repeatedly referred to Marvell and Marvell Israel jointly as a single enterprise:

> Q. But the Marvell Semiconductor's advertising this testing?
>
> A. Yes.
>
> Q. And it's adopting this testing, isn't it?
>
> A. They are advertising this testing as part of, I believe, of their marketing.
>
> Q. And they're trying to convince their customers to buy their chips because of this testing, correct?
>
> A. ***They are advertising what <u>we</u> are giving to <u>our</u> customers***. And ***<u>we</u>*** are giving ***<u>our</u>*** customers a complete platform solution . . .
>
> Q. They're saying testing is crucial?
>
> A. Testing is very crucial for ***<u>our</u>*** customers.

(Tr. 429:9-22) (Rothmann) (emphasis added). Accordingly, more than ample evidence was presented from which the jury could find that Marvell Israel was acting on behalf of Marvell in relation to the testing and that Marvell adopted and ratified the infringing testing as its own.

Separately, the record evidence is sufficient to establish that Marvell Israel was serving as Marvell's representative in performing the ***crucial*** function of field testing the chips that Marvell otherwise would have had to undertake on its own. Mr. Rothmann testified that field testing was a local network requirement that could not be satisfied in an Israeli lab:

> Q. I'm going to turn your attention to field testing. Are you familiar with the concept of field testing?
>
> A. Yes.
>
> Q. Can you explain what it is?
>
> A. In field testing we are doing tests over the operator's network on different location, verifying that solution will work well as a phone as the target customers use it, and verifies that it will not be issues that are coming from difference between the way that the phone is working to the way that the network is working.

(Tr. 423:14-23) (Rothmann).

Mr. Rothmann testified that Marvell had no capability to perform such testing itself and had to rely on Marvell Israel to perform the testing for it:

> Q. Why doesn't Marvell Semiconductor, Inc. perform any testing?
>
> A. They do not have the capabilities or the knowledge. . . .

(Tr. 419:8-10) (Rothmann); *see also* (Tr. 424:9-13) (Rothmann) ("Q. Now, you stated earlier that Marvell Semiconductor doesn't have the ability to perform testing. Is that because all the equipment is in Israel? A. There [are] two issues. One is equipment. The other one is knowledge.")

And Mr. Rothmann further testified that this arrangement reflected nothing other than the division of responsibilities between the customer support function and the chip sales function. (Tr. 430:24-431:6) (Rothmann) ("Q . . . Does Marvell Israel sell chips? They manufacture chips? A. Marvell Israel are the ones that are responsible for the communication and for the customers support. Q. Okay. Do they sell any chips? Do they manufacture any chips? A. I'm not familiar with the way that we -- Marvell sell chips. I'm not part of this organization."). The evidence is sufficient to establish that Marvell Israel was serving as Marvell's representative in performing the crucial testing function that Marvell otherwise would have had to undertake on its own. *Bowoto*, 312 F. Supp. 2d. at 1243; *E & J Gallo Winery*, 2008 WL 2220396 at *5-6, 11-12. Accordingly, substantial evidence supports the jury's verdict of direct infringement against MSI in this case.

2. <u>Substantial Evidence Established Infringing Use by Third Parties in the United States</u>

Finally, Marvell contends that insufficient evidence was presented to establish infringing use

by anyone in the United States. (Post-Trial Motion at 9-10.) However, it is well settled that a finding of direct infringement of a method patent may be based on circumstantial evidence without any direct evidence of use. *Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1272 (Fed. Cir. 1986) ("It is hornbook law that direct evidence of a fact is not necessary. Circumstantial evidence is not only sufficient, but may also be more certain, satisfying and persuasive than direct evidence.") (internal quotation and citation omitted). Thus, evidence of substantial sales of the infringing product, combined with manuals or other materials describing how the device may be used in an infringing manner, constitutes sufficient evidence supporting a jury verdict. *See Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1318 (Fed. Cir. 2009) (evidence of substantial sales coupled with instruction manuals was sufficient circumstantial evidence to show infringing use); *Moleculon Research Corp..*, 793 F.2d at 1272 (extensive sales of the product combined with dissemination of information on their use are sufficient circumstantial evidence to support verdict of infringement).

Here, the jury heard evidence that established that millions of mobile handset devices with Marvell's infringing 3G turbo encoder were sold directly into the United States:

> Q. Dr. Mitzenmacher, can you tell us what this is?
>
> A. Yes, this is an attachment or something that went along with the declaration. It's described in the declaration as [a] report showing the number of Blackberry handheld devices that incorporate certain Marvell processors or chipsets that are capable of operating on UMTS networks, that is 3G networks.
>
> Q. What do you conclude from this document?
>
> A. I believe that it is private information, so I'm not going to give actual numbers, but that millions of such products containing Marvell chipsets were sold into the United States during this time period.
>
> Q. Sold directly into the United States?
>
> A. Directly into the United States.

(Tr. 538:4-16) (Mitzenmacher).

Mr. Sutardja, Marvell's CEO, admitted that it was reasonable to assume that one who purchased one of these smart phones in the United States would turn it on and use it:

> Q. . . . So my question to you is if a U.S. purchaser of a Blackberry smart -- assume we have a U.S. purchaser of a Blackberry smart phone. Is it reasonable to assume

that the purchaser in the United States would use the Blackberry smart phone, would turn it on and use it.

A. Yes, that's a fair assumption. . . .

(Tr. 305:4-17) (Sutardja).

The jury also heard testimony that the turbo encoder in Marvell's 3G chips cannot operate other than in the infringing manner that Dr. Mitzenmacher described, as well as other evidence of infringing use. (Tr. 528:24-529:6) (Mitzenmacher) ("Q. Okay. Reviewing the source code, can Marvell's turbo encoder operate in any manner other than as you described? A. No. . . . No, they cannot function in any manner other than what's described."); (Tr. 536:15-21) (Mitzenmacher) ("Q. And in review of Mr. Dagan's testimony, did he discuss Marvell's turbo encoders in this respect? A. Yes. Q. And what did he say? A. He said that the turbo encoders were used for uplink for sending data from your phone, both in the case when it was required [by the 3G standards], and in cases when it wasn't, when it was allowed."); *see also* (Tr. 415:7-14) (Rothmann).

The jury also had before it extensive evidence of Marvell's advertising materials and product briefs, and corresponding testimony, describing how its products are to be used for advanced, high-speed data communications that involve the infringing Marvell turbo encoder:

Q. If you recall, I believe you stated this is a Marvell Semiconductor, Inc. advertisement, correct?

A. Yes.

Q. What types of applications did they advertise here?

A. I have to get the reference number to say specifically, but they talk about high-speed and data-based applications based on sending data as well as sending voice, but there -- it's a modern advanced smartphone technology where you're not just sending, not just using it as a phone for voice, but you're using it to send data, such as for email or other data uses.

Q. And would a picture -- Mr. Johnson I believe used the example of someone taking a picture of their child. Would sending that be an application that would use turbo coding?

A. Yes.

Q. And what about sending a PDF for work?

A. Yes.

Q. What about sending a Word attachment for work?

A. Yes.

Q. And other advanced applications where you were transmitting?

A. Yes, transmitting data, certainly.

(Tr. 639:4-25) (Mitzenmacher).

Q. And then again, when you look at that, the various headings, the various headings of these sections, this one starts off with "innovative solution for 3G smartphone platforms." What would you understand from that?

A. Again, the intended use of these things is to be used as smartphone devices, that is actually transmitting not just voice, but data information. I don't think very many people would like a cell phone that you could use to take pictures but you couldn't actually send the pictures.

Q. And then the last bullet point we'll talk about is "advanced 3G platform." What would you understand from that?

A. An advanced 3G platform would again have the capability of doing various sorts of uplink data transmissions, and in particular those that use turbo codes.

(Tr. 642:4-18) (Mitzenmacher) (explaining Marvell's PXA 940 Product Brief); *see also* (Tr. 542:9-11) (Mitzenmacher) ("[Exhibit 98] is a marketing document describing the PXA 910. It discusses the uses of -- it describes it as an advanced, highly integrated 3G platform."); (Tr. 543:3-6) (Mitzenmacher) ("[Exhibit 102 is] a marketing document, this time describing the 968. It discusses the advanced capabilities . . ."); (Tr. 543:22-24) (Mitzenmacher) ("[Exhibit 103 is] a similar marketing document for the 978, discussing some of its advanced features . . .").

This circumstantial evidence was more than sufficient for the jury to reasonably conclude that, "sometime during the relevant period . . ., more likely than not one person somewhere in the United States had performed the claimed method using the [Marvell] products." *Lucent Techs., Inc.*, 580 F.3d at 1318. Accordingly, substantial evidence was presented at trial establishing infringing use of the accused products by third parties in the United States.

II. THE EVIDENCE AT TRIAL CLEARLY ESTABLISHED THAT PROF. BERROU WAS PROPERLY NAMED AS THE SOLE INVENTOR

The issuance of a patent "creates a presumption that the named inventors are the true and

only inventors." *Ethicon, Inc. v. U.S. Surgical Corp.*, 135 F.3d 1456, 1460 (Fed. Cir. 1998) (citation omitted). Because of this, "the burden of showing misjoinder or nonjoinder of inventors is a heavy one and must be proved by clear and convincing evidence." *General Elec. Co. v. Wilkins*, 750 F.3d 1324, 1329 (Fed. Cir. 2014); *see also Hess v. Advanced Cardiovascular Sys., Inc.*, 106 F.3d 976, 980 (Fed. Cir. 1997) (*citing Garret Corp. v. United States*, 422 F.2d 874, 880 (Ct. Cl. 1970). Marvell failed to meet this heavy burden.

Professor Berrou's uncontested testimony established at trial that he was the sole inventor of the invention described and claimed in the '747 Patent. And Professor Berrou's testimony was corroborated by strong contemporaneous evidence in the form of a memorandum written by Prof. Berrou in January 1991 recording his invention. (*See* Ex. 293; Tr. 164:7-18 (Berrou)).[1]

Marvell has offered no evidence to support its claim that Alain Glavieux should have been named as a co-inventor. Although Marvell argues that Mr. Glavieux should be credited as an inventor because he alerted Prof. Berrou to the existence of the soft output Viterbi algorithm, (Tr. 162:22-163:2; 163:13-19; 207:19-22) (Berrou), the soft output Viterbi algorithm already was known in the art. (Tr. 163:3-6; 163:13-19; 211:9-11; 222:12-223:1) (Berrou). Merely explaining to the real inventors concepts that are well known in the art is not enough to make a person a co-inventor. *Wilkins*, 750 F.3d at 1332; *Nartron Corp. v. Schukra U.S.A. Inc.*, 558 F.3d 1352, 1356 (Fed. Cir. 2009); *Ethicon*, 135 F.3d at 1460 ("One who simply provides the inventor with well-known principles or explains the state of the art without ever having a firm and definite idea of the claimed combination as a whole does not qualify as a joint inventor."). Prof. Glavieux cannot be considered an inventor merely because he suggested the soft output Viterbi algorithm as a research topic.

Aside from Prof. Glavieux's field-of-study suggestion, Marvell points only to two pieces of "evidence" purporting to support its inventorship argument. First, Marvell refers to the 1993 article published by Professors Berrou and Glavieux and one of Prof. Glavieux's graduate students, Punya

[1] Subsequently, Prof, Berrou filed a French patent application on April 23, 1991 in which he was the sole named inventor. (Ex. 1299; Ex. 5; Tr. 168:17-169:3 (Berrou)). The application that led to the '747 Patent was filed with the U.S. Patent and Trademark Office on April 16, 1992, and claims priority to the French patent application. (Ex. 5.)

Thitimajshima. (Post-Trial Motion at 12.) However, this paper was published a full two years after the French patent application for Prof. Berrou's invention was filed. Quite obviously, as with any significant technological advancement, further work was done after Prof. Berrou made his initial breakthrough. In particular, during this period Prof. Glavieux suggested that Prof. Berrou consider using the specific BCJR soft output algorithm in connection with the invention. (Tr. 172:25-173:5) (Berrou). Use of this particular decoding algorithm further improved the performance of the invention. But this particular decoding algorithm was not part of the claimed '747 Patent invention. Nevertheless, it was part of the basis for the 1993 article and thus Prof. Glavieux properly received credit in the 1993 paper for this and related aspects of the new work. (Ex. 287); (Tr. 185:7-11; 186:13-20) (Berrou). Professors Berrou and Glavieux continued to perform work and research in the area of turbo coding after the publication of the 1993 paper, jointly publishing another paper and jointly obtaining two follow-on turbo code patents. (Tr. 196:19-197:5; 226:6-13) (Berrou). And there is no evidence that Prof. Glavieux ever claimed co-inventorship of the '747 Patent at any time.

Finally, Marvell relies on notice letters from France Telecom's licensing agent, Spectra Licensing, which state that Professors Berrou and Glavieux were co-inventors of "turbo codes". (Post-Trial Motion at 12.) However, Erik Johnson, who authored the letters, testified at trial that his reference to both individuals was in relation to "the overall technology," not the '747 Patent. (Tr. 730:10-13; 853:21-24; 854:2-3) (Johnson); (Tr. 647:4-8; 647:12-16) (Mitzenmacher) (referring to the subsequent joint turbo code patents). Specifically, Mr. Johnson explained: "Professor Berrou was the inventor of the initial seminal turbo code patent [the '747 Patent]. He then collaborated and co-invented with Professor Glavieux on subsequent later patents related to turbo codes that are licensed for other applications." (Tr. 730:14-18) (Johnson); (*see also* Tr. 853:21-854:3) (Johnson).

Thus, Marvell has failed to cite to any evidence, let alone clear and convincing evidence, that supports its claim that Prof. Glavieux should have been named as a co-inventor on the '747 Patent. In all events, there was more than sufficient evidence for the jury to render a verdict in favor of France Telecom on this issue. Accordingly, Marvell's motion on inventorship must be denied.

III. THE EVIDENCE AT TRIAL CLEARLY ESTABLISHED THAT CLAIM 1 OF THE '747 PATENT WAS NOT INVALID AS OBVIOUS

As with its nonjoinder of inventors defense, Marvell must prove its obviousness defense under 35 U.S.C. § 103 by clear and convincing evidence. *Microsoft Corp. v. i4i Ltd. P'ship*, 131 S. Ct. 2238, 2243 (2011). Marvell has failed to meet this burden here as well.

In its Post-Trial Motion, Marvell rests its obviousness argument on the Kasahara article in combination with the interleaving element from the Berlekamp article. (*See* Post-Trial Motion at 14-15.) However, Marvell failed to present to the jury colorable evidence, let alone clear and convincing evidence, that the Kasahara article (alone or in combination with Berlekamp) renders obvious claim 1 of the '747 Patent. As Dr. Mitzenmacher explained at trial, the Kasahara article differs from the '747 Patent in numerous important respects, including: (1) the switch in the Kasahara article prevents source data from going to both encoders as required by the '747 Patent; (2) the Kasahara article does not use systematic convolutional coding; and (3) the Kasahara article does not make any reference to use of an interleaver.

In the '747 Patent, each coding step must take into account ***all of the source data*** elements. (Ex. 5, claim 1); (Tr. 1398:16-20) (Min); (Tr. 1758:10-12; 1761:3-5) (Mitzenmacher). This is an important aspect of the invention. (Tr. 500:21-501:23) (Mitzenmacher). The presence of the switch in the Kasahara circuit prevents each encoder from receiving all of the data elements. In fact, the presence of the switch teaches away from the concept of each encoder receiving all of the source data. (Tr. 1757:21-1758:7; 1761:3-5) (Mitzenmacher). There is nothing in the Kasahara article contradicting Dr. Mitzenmacher's testimony on this point or specifying that all data should go to all of the encoders. (Ex. 1228); (Tr. 1375:25-1376:3) (Min) ("Q: But it doesn't specify -- for example, [Kasahara] doesn't specify that all of the data should go to all of the encoders? A: That's right.").

The '747 Patent also requires the coding steps to implement "systematic convolutional coding." (Ex. 5, claim 1); (Tr. 500:19-20; 553:12-14) (Mitzenmacher); (Tr. 1288:10-16) (Min). The Kasahara article teaches use of only Reed-Solomon coding. (Ex. 1228); (Tr. 1364:24-25) (Min). Reed-Solomon coding is not systematic convolutional coding. (Tr. 1753:17-1755:9)

(Mitzenmacher). Marvell did not present clear and convincing evidence establishing otherwise.[2] On the contrary, Marvell's expert distinguished between convolutional codes and Reed-Solomon codes, further evidencing that they are different types of codes. (Tr. 1329:11-18)(Min) ("Berlekamp talks about usable interleaver in convolutional code, as well as Reed-Solomon code"); *see also* (Tr. 1329:4-6) (Min).

Finally, the '747 Patent requires that the source data elements are interleaved prior to at least one of the coding steps. (Ex. 5, claim 1); (Tr. 496:19-25; 502:6-11) (Mitzenmacher). The Kasahara article does not disclose any interleaving step whatsoever. (*See* Post-Trial Motion at 14-15); (Ex. 1228); (Tr. 1327:10-11) (Min) ("So Kasahara does not expressly teaches [sic] the temporally interleaving part."). Moreover, while Berlekamp describes interleaving (and in fact interleaving was known generally in the prior art), Marvell has identified no prior art reference that applies interleaving to the uncoded source data elements. (Tr. 612:16-19; 1755:18-1756:2; 1759:5-9) (Mitzenmacher); (Tr. 1392:4-18; 1394:20-23) (Min). By contrast, claim 1 of the '747 Patent requires the interleaver to act on ***source data elements***. (Ex. 5, claim 1); (Tr. 1756:6-16) (Mitzenmacher); (Tr. 1394:24-1395:2) (Min). This too is an important aspect of the claimed invention. (Tr. 500:21-501:23) (Mitzenmacher).

Furthermore, Marvell failed to show by clear and convincing evidence that there was a motivation to combine Kasahara with any other prior art reference. And, even if there had been a motivation to combine, Marvell also failed to show that such a combination would have reasonably succeeded in achieving Prof. Berrou's invention. *Bristol-Myers Squibb Co. v. Teva Pharms. USA, Inc.*, 752 F.3d 967, 973 (Fed. Cir. 2014) ("A party seeking to invalidate a patent as obvious must demonstrate by clear and convincing evidence that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success from doing so.") (internal

[2] In its Post-Trial Motion, Marvell appears to attempt to place the burden on France Telecom to prove that Reed-Solomon encoders do not perform convolutional coding. (Post-Trial Motion at 15) ("Furthermore, there is no substantial evidence to support France Telecom's argument . . . ."). This impermissible burden shifting disregards the law, which requires the party challenging the patent to prove invalidity by clear and convincing evidence. *Microsoft*, 131 S.Ct. at 2242; *see also, e.g., ALZA Corp. v. Andrx Pharms., LLC*, 603 F.3d 935, 940 (Fed. Cir. 2010).

quotation and citation omitted). Moreover, several elements of claim 1 would be missing even if all of the prior art references discussed by Dr. Min were combined, (Tr. 1762:4-5) (Mitzenmacher), and thus any such combinations still would not offer "insight into the Berrou configuration."

Finally, the evidence of secondary considerations presented by France Telecom at trial is independently sufficient to support a finding of nonobviousness in this case. The lone challenge that Marvell makes to France Telecom's evidence of secondary considerations relates to the so-called nexus between that evidence and the invention of the '747 Patent. (Post-Trial Motion at 16-17.) In its Post-Trial Motion, Marvell seems to contend that every piece of evidence must explicitly discuss the '747 Patent. *Id.* However, that is not the standard. Rather, the nexus that must be shown is between the evidence of secondary considerations and the ***claimed invention***. *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311-12 (Fed. Cir. 2006).

The evidence of secondary considerations presented by France Telecom was directly tied to the invention embodied in the '747 Patent. For example, the Marconi prize awarded to Professor Berrou was for his "discovery of turbo codes, which opened new avenues of research which have led to modern advances in mobile telephony and satellite and radio communication." (Tr. 630:14-25) (Mitzenmacher). Prof. Berrou testified that he coined the term "turbo codes" and that fact is corroborated in his January 1991 memorandum of the invention. (Tr. 166:1-5) (Berrou). Similarly, Professor Berrou's nomination for Inventor of the Year by the European Patent Office is directly connected to the invention since Prof. Berrou was nominated for the foreign counterpart of the '747 Patent to which the '747 Patent claimed priority. (*See* Ex. 5.) Moreover, Prof. Berrou's invention was nominated in the "Industry" category further linking the invention to commercial success. Thus, there was sufficient evidence connecting the recognition and awards bestowed upon Prof. Berrou to his invention claimed in the '747 Patent.

At trial, France Telecom also presented the jury with evidence of over 50 license agreements with other companies covering the '747 Patent. (Tr. 662:15-17) (Johnson). Every such license covered at least the claimed invention. (*See, e.g.*, Exs. 16, 17, 18, 19, 41); (*see also* Tr. 1501:11-18; 1504:20-1505:6; 1505:13-23; 1506:10-17; 1506:21-1507:2) (Davis). In fact, several of these

licenses covered only the invention of the '747 Patent (as protected by the '747 Patent and its foreign counterparts). (Exs. 16, 17, 18); (Tr. 1505:13-23; 1506:10-17; 1506:21-1507:2) (Davis). These facts on their face establish a clear nexus between the licenses and the claimed invention.[3] Furthermore, many of the licenses are directed specifically to use of the patent in 3G telecommunications applications, evidencing both the need for the patented invention in such applications as well as the commercial success of the invention.

Marvell has failed to show that claim 1 of the '747 Patent is obvious by clear and convincing evidence or by any other standard. Accordingly, Marvell's motion for invalidity under Section 103 likewise must be denied.

IV. CLAIM 1 OF THE '747 PATENT RECITES PATENTABLE SUBJECT MATTER

In its Post-Trial Motion, Marvell also tries to resurrect its partial motion for summary judgment, asking the Court to invalidate claim 1 of the '747 Patent on the grounds that the claim purportedly recites unpatentable subject matter. Marvell must prove this invalidity defense by clear and convincing evidence as well. (D.I. 160 at 12-13); *Calif. Inst. of Tech. v. Hughes Communs., Inc.*, No. 2:13-cv-07245-MRP-JEM, 2014 U.S. Dist. LEXIS 156763, at *6 n.6 (C.D. Cal. Nov. 3, 2014) ("*Caltech*"). The Court should reject Marvell's motion for the same reasons that it previously rejected this Marvell argument. Claim 1 recites signal processing steps that are implemented by means of a particularized structure of components. These steps transform data in such a way as to yield tangible physical results, namely, the transmission of information at error rates that were significantly improved over prior art methods, in the face of the physical phenomenon of noise.

A. Claim 1 Recites a Process With a Particularized Structure for Error-Correction Coding, Not a Mathematical Algorithm

The invention described and claimed in claim 1 is not a mathematical algorithm at all: while certain components used in the method can be described using mathematics, the arrangement of

[3] For purpose of obviousness analysis, the fact that these licenses also covered foreign counterparts or even other patents is not material. *See Ormco*, 463 F.3d at 1311-12; *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1353-54 (Fed. Cir. 2012) (finding a nexus between the invention and Transocean's license agreements where the defendant argued that no nexus existed because the licenses conveyed rights to the patent in suit as well as foreign counterparts and other patents not part of the case).

these components involves no mathematics; rather, it is the relationship between the component modules that determines how the input signal's source data is transformed into a systematic code word to be transmitted across a communications channel. Indeed, Claim 1 is an example of the Supreme Court's observation that "[a]pparatus and method claims may approach each other so nearly that it will be difficult to distinguish the process from the function of the apparatus." *Quanta Computer, Inc. v. LG Elecs., Inc.*, 553 U.S. 617, 629 (2008) (internal quotation and citation omitted).

It is well-settled that a patent claim is not invalid merely because it includes a law of nature or mathematical algorithm. *Digitech Image Techs., LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1350 (Fed. Cir. 2014). Rather, "an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection." *Id*. (internal quotation and citation omitted). Thus, a claim may be eligible if it includes additional inventive features such that the claim scope does not solely capture the abstract idea. *Id*. This is precisely the circumstance presented here, as the Court already determined in its decision on Marvell's partial motion for summary judgment. Specifically, the Court found that claim 1 "provide[s] unique and detailed methods with concrete steps to be applied" and "'inventive concepts' that exceed the prior art, namely coding in parallel". (D.I. 160 at 14-15.) The Court's determination was confirmed by the testimony at trial.

> Q. Now, in your opinion does Claim 1 of the Berrou patent only describe mathematical algorithms?
>
> A. No, it doesn't.
>
> Q. Okay. And why not?
>
> A. I mean, it's talking about a specific design, specific sort of arrangement or series of components. We see that in the language and in the figures, you know, it's talking about things such as having the two independent and parallel steps of systematic convolutional coding. Those are very specific design features and structure that's being denoted in that phrasing. . . . The interleaving itself, right, which is referred to as temporal interleaving, so interleaving is an element that modifies the order, and again, its placement, as we've discussed in the -- throughout the trial, and how it's used in its placement in order to reorder the data at the appropriate place and time, denotes a structure.

(Tr. 2160:2-25) (Mitzenmacher).

Dr. Mitzenmacher further explained that this particularized arrangement results from a series

of specific engineering design choices:

> Q. Okay. Now, the structural features that you talked about, parallel encoding taking account of the source data elements, providing parallel outputs and interleaving, are those just -- are those design choices?
>
> A. Yes, they're absolutely design choices and [a] specific combination of design choices that the patent describes and discusses the implementation of.

(Tr. 2161:7-13) (Mitzenmacher).

In its Post-Hearing Motion, Marvell repeatedly asserts that this arrangement describes only a mathematical algorithm. (Post-Trial Motion at 18) ("it recites only a mathematical algorithm"); (*id.* at 21) ("Claim 1 covers nothing more than a naked mathematical algorithm"); (*id.* at 22 n. 16) ("independent and parallel" language "is part of the mathematical algorithm"); (*id.* at 24) ("claim 1 of the '747 patent recites nothing more than a mathematical algorithm"); (*id.* at 25) ("this language is part of a mathematical algorithm and identifies the parameters of the calculations"). But Marvell provides no evidence or analysis to support its bald assertion. Rather, Marvell simply declares, *ipse dixit*, that this is so. The evidence establishes otherwise. As Dr. Mitzenmacher explained:

> Q. Okay. Are these design choices compelled by any natural law?
>
> A. No, I mean not at all. I mean, I think these are seen in the prior art that there were -- people were encoding in other different ways. There's nothing on higher or mathematical law that would suggest or push for this sort of configuration.

(Tr. 2161:14-18) (Mitzenmacher). Indeed, Marvell's own expert admitted that the method described in claim 1 contains engineering design choices:

> Q. Would you agree with me that the choice of putting a temporal interleaving between two coding steps, as shown in Figure 1, is an engineering decision?
>
> A. It is -- yeah, it's in part engineering decision. That's correct.

(Tr. 2141:8-12) (Mitzenmacher).

Finally, it is these very same design choices that give power and efficacy to the invention embodied by claim 1. Claim 1 is directed to addressing the real world, physical problem of "noise" as it impacts transmissions of data. (Tr. 2151:2-2152:3) (Mitzenmacher) ("what the scheme does is by devising a specific sort of layout of various components, it develops a program or a method for implementing a way of producing redundancy that's particularly effective against various types of

noise."). It is the structural arrangement of the design choices made in the invention, not the mathematical algorithms used in the invention, which provides this effectiveness:

> Q. Okay. Now is the encoding method of claim 1 effective against the burst error phenomenon?
>
> A. Yes, it is.
>
> Q. Okay. Now, do you recall in Dr. Min's testimony the mathematical operations that Dr. Min performed on the board?
>
> A. Yes.
>
> Q. Okay. Now is it those mathematical operations or is it the arrangement of the components in Claim 1 that make Claim 1 effective against burst error?
>
> A. I mean, I would say it's the arrangement of the components, because it's the specific design itself that Professor Berrou came up with in the patent that is what makes -- gives the benefits of the claim.
>
> Q. Okay. And you explain in your direct testimony early in the case that the encoding method of claim 1 was a novel way to create a very powerful way of encoding source data.
>
> A. Yes.
>
> Q. Okay. Now, again, is it the mathematical operations that Professor Min performed on the board or is it the arrangement of the components in Claim 1 that gives that powerful encoding method?
>
> A. I mean, it's the arrangement of the components. . . . [T]hings like systematic convolutional coding existed previously, and we've seen serial concatenated coding that existed previously. The reason you get this particular performance is the particular arrangement in the particular design that Professor Berrou came up with and is embodied by this claim, that you get those benefits.

(Tr. 2169:4-2170:7) (Mitzenmacher).

B. <u>Claim 1 Is Limited to A Specific Method of Error-Correction Coding</u>

Claim 1 of the '747 Patent is confined to a specific, particularized implementation of error-correction coding. The claim does not "preempt all use of a class of fundamental mathematical equations" as Marvell incorrectly contends. (Post-Trial Motion at 27.) Once again, the Court has already considered and rejected this Marvell argument. (*See* D.I. 160 at 14-15) ("These claims will not preempt all applications of an abstract idea. They are limited to one method for 'error-correction coding of source digital data elements' . . . . Claim 1 does not preempt error-correction coding gen-

erally . . . [It] 'confines the claims to a particular useful application' . . . and 'seeks only to foreclose from others the use of the abstract idea in conjunction with all of the other steps in their claimed process'"). The trial testimony reinforced and confirmed the Court's prior ruling. For example, Dr. Mitzenmacher confirmed that claim 1 does not preempt the abstract idea of coding in general nor, in particular, does it preempt the use of the very same mathematical algorithms in other methods of coding, such as systematic convolutional coding or serial concatenated coding:

> Q. Now, in your opinion, does claim 1 describe an abstract idea?
>
> A. No.
>
> Q. Okay. Can you explain?
>
> A. I mean, again, we've gone through the various specific components that are being discussed and talked about. . . . [I]f you're talking about coding, for instance this doesn't cover the abstract idea of coding. It just covers a very specific implementation of a specific type of code with various structural features. You know, even if you were to say things like, you know, this tries to cover systematic convolutional coding, again, no, it doesn't. . . . [I]t covers, again, not systematic convolutional coding, but a specific configuration involving in this case multiple coders and certain design elements in the placement of those elements with relative ordering of those elements which would correspond to design decisions…
>
> Q. Okay. Are there encoding methods that would not be covered by claim 1?
>
> A. Absolutely.
>
> Q. Can you describe a few?
>
> A. . . . Certainly, we've seen just plain vanilla, single versions of systematic convolutional coding as prior art that this builds upon. We've talked about Reed-Solomon codes, which are a type of block code that we've seen again in sort of the prior art that existed prior to this patent. The patent discusses itself this notion of serial concatenation of codes, as opposed to parallel concatenation . . . so there are several types of coding systems that are clearly not covered by this patent.
>
> Q. Okay. And you're familiar with low density parity check codes?
>
> A. Yes, LDPC codes, low density parity check codes.
>
> Q. Would they typically be covered by claim 1?
>
> A. Typically, no. . . .

(Tr. 2161:20-2163:13) (Mitzenmacher).

Moreover, even if the claim at issue were found to touch on an "abstract idea," the Court

would have to also evaluate the remainder of the claim to determine whether it contains additional substantive limitations that represent "sufficiently inventive concepts" so that the claim does not cover the full abstract idea itself. *Caltech*, 2014 U.S. Dist. LEXIS 156763 at *9-10, 47-48. As demonstrated above, claim 1 of the '747 Patent contains numerous inventive structural elements that define and narrow the scope of the claim and which give rise to the power and efficacy of the claimed error-correction coding technique.

For these reasons, Marvell's reliance on *Digitech* is misplaced. (*See* Post-Trial Motion at 27-28.) Unlike here, the Federal Circuit in *Digitech* found that the method in that case was not tied to any specific structure and contained *no* additional limitations other than the mathematical algorithm itself. *Digitech*, 758 F.3d at 1350-51. Rather, the claim at issue in that case merely recited the steps of gathering a first set of data, gathering a second set of data, and combining both sets of data together. *Id*. In essence, the claims were so broad that they essentially represented little more than an attempt to patent addition. *Caltech*, 2014 U.S. Dist. LEXIS 156763 at *31 ("In *Digitech* the claims were so broad as to capture a large amount of inventive activity and in effect impede innovation."). By contrast, claim 1 of the '747 Patent contains numerous inventive limiting features including the specific parallel arrangement of encoders, the specific placement of the interleaver, the required use of all source data elements in each encoder, and parallel outputs of coded data elements. *Digitech* is simply irrelevant here.

By contrast, the recent decision by the United States District Court for the Central District of California in *Caltech* is directly on point. In *Caltech*, the court found method claims for error-correction coding patentable under Section 101 because they contained inventive limitations such that they did not preempt error-correction coding as a whole. *Caltech* is indistinguishable from the instant case. Indeed, if anything, the claims at issue here present a more compelling case for patentability than the error-correction methods at issue in *Caltech.* This is because, in *Caltech*, the inventive limiting features themselves consisted of mathematical algorithms. *See Caltech*, 2014 U.S. Dist. LEXIS 156763 at *53 ("But in claim 1 of the '032 patent, the mathematical formula reflects inventive concepts"). By contrast, here the innovative concepts relate to design choices that resulted in

the particular structural arrangement of the various steps set forth in claim 1. (Tr. 2169:4-2170:7) (Mitzenmacher).

C. A Human Cannot Perform the Method Described in Claim 1

The method of error-correction coding described in claim 1 of the '747 Patent cannot be performed by a human. Significantly, in its Post-Trial Motion, Marvell carefully avoids any claim that a human could perform the patented method. Instead, Marvell merely asserts that a human could perform, in isolation, certain of the steps of the process described in claim 1. (Post-Trial Motion at 26-27.) However, Marvell's argument is contrary to the basic tenet that, in determining patent eligibility, claims "must be considered as a whole." *Diamond v. Diehr*, 450 U.S. 175, 188 (1981). In fact, a human cannot perform either the individual steps of the claimed method nor the claimed method as a whole. For example, a human being cannot "implement" the "parallel" steps of systematic convolution coding required by claim 1. Nor can a human being provide "parallel outputs" of coded data elements. These facts were established by Dr. Mitzenmacher at trial:

> Q. Are you aware of Dr. Min's opinion that Claim 1 of the Berrou patent purportedly can be performed by a human being mentally or by hand?
>
> A. I'm aware of that opinion.
>
> Q. Okay. And what's your opinion on that subject?
>
> A. Again, I would disagree. . . . [J]ust focusing on the language of the patent, [it] talks about, you know, implementing or an implementation, and a human is not to me an implementation of an error-correction code. A human can attempt to emulate some of the steps that such a device or a code would take, but a human is not an implementation. And I think that becomes clear when we look at some of the more specific language in this claim where we talk about two independent and parallel steps of systematic convolutional coding, right, I don't believe humans have -- I certainly don't know that humans have structures that would correspond to being able to form independent and parallel steps in the way that we see in the figures or the way described in the patent.
>
> You know, similarly in terms of providing parallel outputs, I don't think humans really provide parallel outputs. I mean, they can provide -- they can write something down. They can attempt to emulate a circuit or an implementation, but humans can't provide parallel outputs in any concrete way I know of. Even when we're talking about thing like temporal interleaving, right, so the re-ordering, again, humans don't actually re-order pieces of data. They can emulate that in various ways, but they don't actually implement a re-ordering type system.

> So, again, I think, just looking at the language of that, the patent is clear that . . . human beings can't actually meet the claim elements in the patent.

(Tr. 2166:21-2168:5) (Mitzenmacher). *See also Caltech*, 2014 U.S. Dist. LEXIS 156763 at *50 ("A human could perform the calculations that would yield the value of a parity bit. But [Defendant's] statement is literally wrong. It states the obvious to say that a pencil and paper cannot actually produce parity bits.")

Furthermore, while a human could "emulate some of the steps for convolutional coding or a human could attempt to write down the steps that are performed in systematic coding in the same way a human being can add two numbers," a human "absolutely" cannot do such things on the scale necessary for transmission of data in a noise environment. (Tr. 2168:16-23) (Mitzenmacher). *See also Caltech*, 2014 U.S. Dist. LEXIS 156763 at *50 ("Many inventions could be theorized with pencil and paper, but pencil and paper can rarely produce the actual effect of the invention. Likewise, with regard to software, a human could spend months or years writing on paper the 1s and 0s comprising a computer program and applying the same algorithms as the program. At the end of the effort, he would be left with a lot of paper that obviously would not produce the same result as the software. . . . [A]lthough a computer performs the same math as a human, a human cannot always achieve the same results as a computer").

The testimony of Dr. Min does not alter these facts. At no time during his testimony did Dr. Min operate in "parallel" or provide "outputs" of anything, in "parallel," or otherwise. Instead, Dr. Min's testimony confirmed that a human being cannot operate in such a manner. Dr. Min also did not dispute that a human being cannot perform any of the steps on the scale necessary for transmission of data in a noisy environment.

Furthermore, assuming arguendo that claim 1 of the '747 Patent could be performed by a human (and it cannot), that would not render the claim invalid. Such a "mode of analysis [is] unhelpful for computer inventions." *Caltech*, 2014 U.S. Dist. LEXIS 156763 at *50. "The Court should not ask whether a human can calculate parity bit values using a pencil and paper. Instead, the Court must ask whether the formula in claim 1 constitutes an inventive concept that sufficiently limits the claims preemptive effect. It does." *Id.* at *51. Like the claims at issue in *Caltech*, claim 1 of

the '747 Patent contains numerous inventive concepts that limit and narrow the scope of the claim.

D. Claim 1 Otherwise Satisfies the "Machine-or-Transformation" Test

Claim 1 of the '747 Patent also satisfies the so-called "machine-or-transformation" test. It is important to note that the machine-or-transformation test is not the exclusive test for patentable subject matter under Section 101. In fact, "there are reasons to doubt" whether the test is well-suited for assessing "the patentability of inventions in the Information Age" such as those dealing with "data compression" and "the manipulation of digital signals." *Bilski v. Kappos*, 661 U.S. 593, 605, 606 (2010) ("Section 101's terms suggest that new technologies may call for new inquiries."). Thus, while meeting the machine-or-transformation test is not required, it does provide an independent basis for finding the patent valid in this case. (*See* D.I. 160 at 16, 20-21.)

Claim 1 is "related to signal processing and the construction of mechanisms within signal processing for handling this issue of noise during the course of transmission." (Tr. 2152:24-2153:2) (Mitzenmacher). Claim 1, itself, requires "implementation" of the method steps recited therein and the patent discusses at length the actual construction of circuits and devices for implementing those method steps. (*See* Tr. 2153:10-13; 2153:21-2154:4; 2154:14-19; 2155:12-15; 2155:22-2156:23) (Mitzenmacher). Prof. Berrou, the inventor, explained this at trial:

> Q. So Claim 1 doesn't talk about the hardware, right?
>
> A. Oh. Yes.
>
> Q. Let me ask it.
>
> A. Implementing, implementing means hardware, sorry.
>
> * * *
>
> Q. Professor Berrou, you referred to the word implementing in your answer. In this invention of yours, what do you understand the implementing to be referring to?
>
> A. I was and still am an electrical engineer. My main activity was about implementing with transistors, and basically in this case implementation of powerful error-correction coding.

(Tr. 445:15-18; 455:6-12) (Berrou); *see also* (Tr. 446:24-447:1) (Berrou) ("Of course, when you describe -- describe such ideas without material these ideas are not in, you need material to implement this"); (Tr. 456:3-6) (Berrou) ("I was the first engineer to implement this in a circuit. That was

my initial goal. So this, again, this Fig. 1 is [a] block diagram of a circuit, whatever the technology, if PGA, DSP, specifically integrated circuit."). Dr. Mitzenmacher concurred:

> Q. And so is your distinction between simulation and implementing in your understanding in Professor Berrou's testimony?
>
> A. Yes. I mean, certainly in implementing he's referring to the actual implementation of transistors and such of circuitry as we've described . . . .

(Tr. 2200:9-14) (Mitzenmacher).

More importantly, however, the machine-or-transformation test does not require that the invention recite the use of any machine. Rather, it is sufficient that the method of the invention "transforms a particular article ***to a different state*** or thing." *In re Bilski*, 545 F.3d 943, 954 (Fed. Cir. 2008) (emphasis added). As the Court previously held, that transformation can include transformations in the state of data. (D.I. 160 at 16, 20-21); *see also Research Corp. Techs. v. Microsoft Corp.*, 627 F.3d 859, 868-69 (Fed. Cir. 2010); *Arrhythmia Research Tech., Inc. v. Corazonix Corp.*, 958 F.2d 1053, 1059-61 (Fed. Cir. 1992); *TQP Dev., LLC v. Intuit Inc.*, No. 2:12-cv-180-WCB, 2014 WL 651935, at *5-7 (E.D. Tex. Feb. 19, 2014).

Claim 1 of the '747 Patent changes the ***state*** of the data that it is encoding. Specifically, the method embodies a particularized process for constructing code words consisting of the original data plus new, redundant pieces of data. Indeed, the method of claim 1 produces a new thing. It is this powerful new code word created by the method of claim 1 that protects the data from corruption by noise in the transmission, as Dr. Mitzenmacher explained:

> I think one of the key features of the Berrou patent [is], really what it's trying to do is giving you a way of transforming the data in order to make it better suited for transmission in settings where there's going to be errors, in particular burst errors, but other types of errors as well.
>
> The whole point, I think we've talked a lot in this case about you start with the source data, and then you build up somehow what's called the code word for transmission, and what this patent is doing is devising a way of building up that redundancy, building up the additional information that will allow it to protect against various types of errors.

(Tr. 2164:1-11) (Mitzenmacher).

Dr. Min, Marvell's expert, agreed that the method of claim 1 constructs code words for

transmission. (Tr. 2118:10-15) (Min) ("Q. And you agree with me, don't you, that the Berrou patent describes a method for creating systematic code words, doesn't it? A. As a result of transmitting current input data and the coded bit, as data combined as a single code word and becomes a systematic code word."); *see also* (Tr. 2119:13-21) (Min).

Dr. Mitzenmacher further explained that it was not the mathematical algorithm that was responsible for the pertinent transformation, but rather, the structural implementation of the claim elements. Dr. Mitzenmacher also explained that it was the construction of the particular type of redundancy resulting from that implementation that resulted in the novelty and usefulness of the invention:

> Q. And the transformation of data, which I heard you talk about in connection with questions from Mr. LoBue, transformation of data is done by math, right?
>
> A. No, I mean not in this context. It's done by actual implementation.

(Tr. 2179:25-2180:4) (Mitzenmacher).

> Q. Professor Mitzenmacher, what's new and useful about method Claim 1 over the prior art?
>
> A. I would say the particular structure, the various design elements that he developed that allows for construction of this particular type of redundancy that's particularly effective against certain types of noise. . . .
>
> I mean, it's a very specific and interesting design structure that provides a better method of error-correction coding.

(Tr. 2198:13-23) (Mitzenmacher).

Claim 1 of the '747 Patent transforms the state of data such that it separately satisfies the machine-or-transformation test, independently confirming the validity of the patent.

CONCLUSION

For all of the above reasons, the Court should deny Marvell's Post-Trial Motion.

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